

First record of the invasive species *Xenostrobus securis* (Lamarck, 1819) (Bivalvia: Mytilidae) from Central Tyrrhenian Sea (Western Mediterranean)

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Abstract

A new population of the invasive brackish water mytilid *Xenostrobus securis* (Lamarck, 1819) was found in Tuscany, in August 2006, at the outlet of an artificial canal flowing close to the Leghorn harbour. This is the first finding of the species along the Italian coasts of the Tyrrhenian Sea. The proximity of this pioneer population to the Orbetello lagoon calls for an immediate monitoring activity of the species.

Riassunto

Prima segnalazione di una specie invasiva *Xenostrobus securis* (Lamarck, 1819) (Bivalvia Mytilidae) dal Mar Tirreno Centrale (Mediterraneo occidentale).

Una nuova popolazione di *Xenostrobus securis* (Lamarck, 1819) è stata rinvenuta in Toscana nell'agosto 2006, nel tratto finale del canale scolmatore del fiume Arno. Gli esemplari di *X. securis* sono stati osservati aderenti a fusti di plastica usati come galleggianti per chiatte da pesca, a volte in associazione con individui di *Mytilus galloprovincialis* (Lamarck, 1819). *X. securis*, specie originaria dell'Australia e Nuova Zelanda, è stato rinvenuto come specie introdotta in Giappone, Mar Mediterraneo e Spagna (coste atlantiche). In Italia è stato segnalato già a partire dal 1992 in alcune località dell'alto Adriatico. Il presente record rappresenta la prima segnalazione della specie lungo le coste tirreniche. La vicinanza di questa popolazione alla laguna d'Orbetello rende auspicabile un'immediata attività di monitoraggio della specie nell'area livornese.

Key Words

Bivalvia, *Xenostrobus securis*, brackish waters, invasive species, Italy, Tyrrhenian Sea.

Introduction

Xenostrobus securis (Lamarck, 1819) is a mytilid species, well adapted physiologically for persistence in areas with variable and unstable salinity conditions. It can tolerate very broad variations between the range 1‰ to 31‰ (Wilson, 1968; 1969). The species has been introduced from its native areas, Australia and New Zealand (Wilson, 1968; Powell, 1979), to Japan (Kimura et al., 1999), the Mediterranean Sea (Gofas & Zenetos, 2003), and off Galicia, NW Spain (Garci et al., 2007).

In Italy, the invasive mytilid *Xenostrobus securis* was first recorded in 1992 from Venice lagoon as *Xenostrobus* sp. (Sabelli & Speranza, 1993) and successively reported in other Adriatic Areas as the Ravenna lagoon (Lazzari & Rinaldi, 1994), Porto Buso (De Min & Vio, 1997) and the Po river delta (Russo, 2001). Here the species has been possibly introduced with aquaculture, and its massive presence in the Adriatic lagoons, along with *Auadara inaequalis*, has in fact been related to the intense shellfish farming occurring in this area (Occhipinti Ambrogi, 2000). In the Western Mediterranean, it was reported only once before, in French Mediterranean lagoons, where it is very abundant in the canal between Etang du Vidourle and the sea, at Le Grau du Roi, as reported in the CIESM web site for alien species (CIESM, 2007 on line).

Material and methods

The new population was discovered by one of the Au-

thors (F.G.), on August 2006, during maintenance work of the plastic drums used as buoys for fishing platforms. These platforms were located close to the outlet of the artificial canal called "canale scolmatore" (43°35'06.30"N, 10°18'20.63"E) (Fig. 1), which is connected with the Arno river. This artificial canal, which receives the Arno overflow during intense rain events, opens southwards to Calambrone beach (Pisa), and northwards to the Leghorn harbour (Fig. 1).

On these buoys, *X. securis* formed monospecific clusters of variable extension (Fig. 2). Further surveys also revealed the co-occurrence of this species with *Mytilus galloprovincialis* (Lamarck, 1819) (Fig. 3) on other submerged structures along the artificial canal. About 100 specimens were collected and examined. The shell colour was brown to dark brown, almost black, and varied in the outline being more or less slender (Fig. 4), in the range of variability typical for the species. The interior of the shell had a purple area corresponding to the posterior-dorsal side of the valves, while the anterior-ventral side was whitish (Fig. 4).

Discussion

X. securis represents the third alien bivalve species recorded in recent years from the Leghorn area. In fact, also *Theora (Eudopleura) lubrica* Gould, 1861 (Semelidae) (native area: Japan) and *Musculista seultousia* (Benson in Cantor, 1842) (Mytilidae) (widespread in the Indo-Paci-

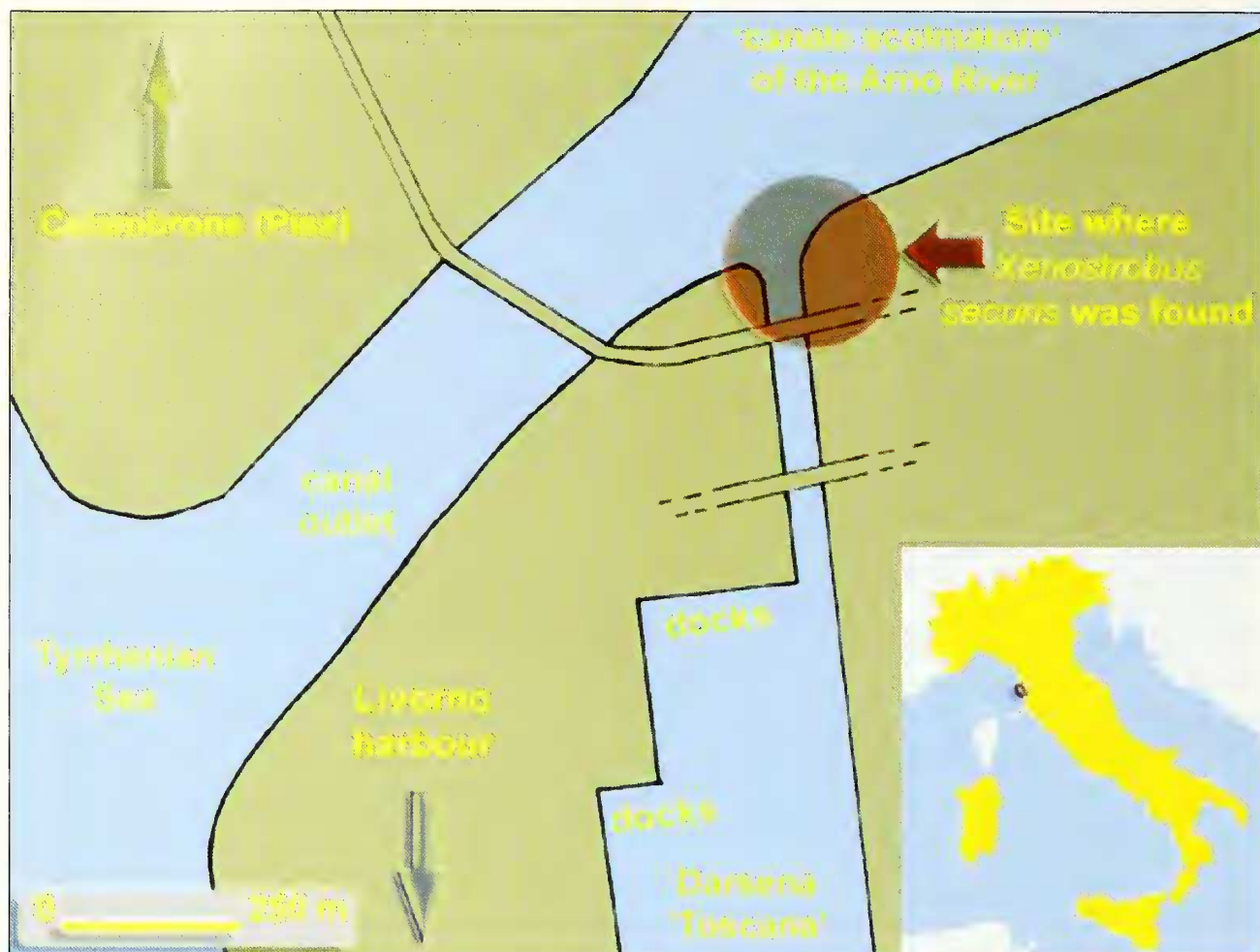


Fig. 1. Map of the sampling station, between the 'Canale scolmatore' and the 'Darsena Toscana' of the Leghorn harbour.

Fig. 1. Planimetria della stazione di prelievo, tra il Canale scolmatore e la Darsena Toscana del porto.

fic) were reported from the Leghorn harbour (Campani et al., 2004), which, therefore, can be considered as a 'hotspot' for alien species. The presence of *X. securis* along the 'Canale scolmatore', which is in connection with the 'Darsena Toscana' area of the Leghorn harbour (Fig. 1), a dock for large commercial ships, may reasonably be explained with a possible spread of *X. securis* larvae throughout the release of ballast waters.



Fig. 2. Monospecific clusters of *Xenostrobus securis* on plastic drums used as artificial buoys for fishing platform

Fig. 2. Cluster monospecifici di *Xenostrobus securis* su fusti di plastica usati come galleggianti per chiatte da pesca.

This specific site had been already investigated in 2001-2004 by Campani et al. (2004), but the target species was not recorded. It is therefore possible that the settlement of the observed population of *X. securis* has taken place between the years 2005-2006. However, as Campani et al. (2004) have limited their study on soft bottoms by means of a small dredge, the possibility that the species has been overlooked cannot be ruled out.

The proximity of the study site with the Orbetello lagoon, located in southern Tuscany, calls for an immediate monitoring activity of the possible spread of this species. The Orbetello lagoon, located in the Grosseto Province (between 42°25' and 42°29'N and between 11°10' and 11°17'E, covering a total area of 25.25 km²) is one of the Natural Reserves of the Grosseto Province (C.P. N° 72, 13-mag-98). This lagoon has been affected in the past by severe eutrophication phenomena, determined by the presence of treated urban and wastewaters from land based fish farms, which triggered seaweed proliferation. At present, several restoration strategies have been taken into account (e.g. Lenzi et al. 2003) to preserve and restore the original lagoon system.

Therefore, the spread of *X. securis* in the Orbetello lagoon may potentially have a severe, negative impact in this environment, as the species is able to become invasive and smother the infauna by covering soft sedi-



Fig. 3. Co-occurrence of *Xenostrobus securis* (arrows) and *Mytilus galloprovincialis* (Lamarck, 1819) on submerged metal structures from the study area.

Fig. 3. Associazione di *Xenostrobus securis* (freccie) e *Mytilus galloprovincialis* (Lamarck, 1819) su strutture di metallo immerse nella zona studiata.



Fig. 4. Some specimens of *Xenostrobus securis* from the study site. Approximate length: 2 cm.

Fig. 4. Alcuni esemplari di *Xenostrobus securis* dall'area studiata. Lunghezza approssimativa di 2 cm.

ments. For this reason, the species is regarded as one of the worst invasive alien species in Europe by the SE-BI2010 working group (<http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995>), as well as in the Mediterranean (Streftaris & Zenetos, 2006).

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